4.13 Lifecycle Engineering

4.13.1 What is Lifecycle Engineering?

Lifecycle Engineering (LCE) is defined as an objective process to evaluate the constraints and dependencies associated with developing and operating a product or service. Lifecycle Engineering seeks to maximize a product's value while minimizing its cost of ownership over the entire lifecycle. The lifecycle includes the entire spectrum of activity for a given system, starting with identification of a need and extending through design and development, production and construction, operational use, sustainment of support and system retirement, and, eventually, disposal.

Organizations are constantly looking for ways to respond to problems that become apparent with products and services and also to the need to achieve new performance levels. The approach to responding to these needs often involves system redesign and improvement of development and operational processes. In addition, the products and services often required an integrated approach to incorporating a heterogeneous collection of both legacy and emerging systems.

LCE design considerations address procurement and other issues related to the **entire product lifecycle**. It must account for the environment in which the product will operate. Decisions made in early phases of the lifecycle affect the overall cost throughout the lifecycle. Procurement costs are the most apparent costs associated with the early lifecycle. Costs that occur later in the lifecycle, such as maintenance costs, are directly related to decisions made in planning and procurement activity. Consequently, LCE focuses on design, implementation, and operational decisions that will significantly impact the product lifecycle cost.

4.13.2 Why Perform Lifecycle Engineering?

LCE activities define constraints, design features, and system characteristics that are encountered throughout the lifecycle of the system. At minimum, analysis results shall be available at standard design milestones, including the preliminary and critical design reviews, and the performance reviews. LCE work supports identification of cost benefit tradeoffs, determines design progress, measures technical soundness, and supports mitigation of risk items. Stakeholders[1] use LCE results to ensure that the product performs as intended. LCE also supports engineering to evaluate design. The main objective of LCE is to meet the cost and performance objectives during the entire product lifecycle. Programs provide services that may be obtained from systems as well as systems having multiple system elements (e.g., system of systems). Services obtained from functions allocated to multiple systems are subject to different criteria as a result of managing multiple product baselines. Service capabilities of such “homogeneous” system configurations are constrained during development, deployment, and sustainment activities more than would be the case for those capabilities provided by service elements. LCE manages costs from inception (cradle) to disposal (grave) for equipment and projects over their anticipated useful lifespan. LCE aims at providing an engineering discipline that provides best results when both art and science are merged with good judgment.

4.13.3 Lifecycle Engineering Steps

The LCE process consists of six steps—needs identification, technical assessment, technology insertion, operational assessment, performance analysis, and establishment of service

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1 It’s presumed that the stakeholders are the same as identified for the Investment Analysis process; however, it is possible for stakeholders to change during the lifecycle management phase of the Acquisition Management System model.

environment (see Figure 4.13-1). Products are produced from executing these LCE steps (see Figure 4.13-2). Inputs from other System Engineering (SE) elements are required to perform LCE, and LCE products are required to effectively support other SE elements.

LCE activities support the FAA Acquisition Management System (AMS) Lifecycle phases and major decision points. LCE process steps map to these phases. LCE steps identify functional benefits and estimate costs for system features and updates throughout the entire lifecycle. LCE uses Earned Value Measurement (EVM) techniques to define cost and schedule targets and provide the metrics for reporting LCE activity status. The resulting reports reflect the scope, complexity, and cost performance objectives that the planning activities provide.

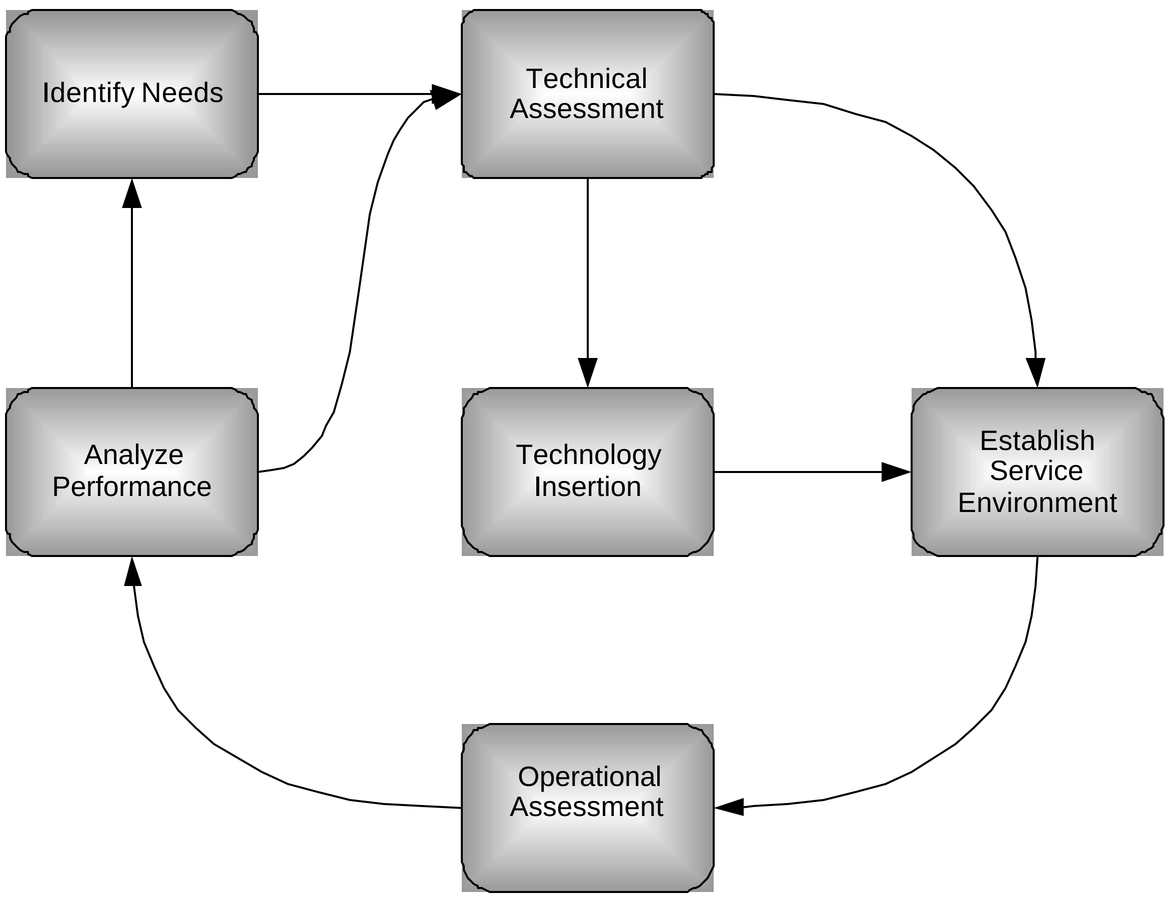

Figure 4.13-1. LCE Process Steps

Process:

Lifecycle Engineering

ID No.: 4.13 (iCMM PA 5, 9, 10 & 12)
Date: April 25, 2000
Revision Date: August 30, 2006

Next Higher Level Process:
Perform System Engineering

Process Owner:
System Engineering Council

Process Objective:
To meet the cost and performance objective of a system during it's entire Lifecycle.

Inputs

a) Constraints Environmental Forces, Government and International Regulations and Statutes, FAA policy, Technology, Concerns/Issues, Integrated Master Schedule, System
b) NAS Enterprise Architecture, SEMP, WBS
c) Requirements
d) OSED
e) Physical Architecture, Operational Prototype Results, Constraints
f) Trade Study Reports
g) Design Analysis Reports
h) Analysis Criteria
i) Risk Mitigation Plan
j) Baselines, Baseline changes, Configuration Status Reports
k) SE Processes, SE Best-Practices Document (SEM), SEBOK

Providers

a) EXT
b) ITP
c) RM
d) FA
e) SYN
f) TS
g) SpecEng
h) IA
i) RSK
j) CM
k) MSE

Beginning Boundary Task

Identify interfaces

- Identify Needs
- Technology Assesment
- Technology Insertion
- Operational Assessment
- Analyze Performance
- Establish Service Environment

Ending Boundary Task

Control interfaces

Lifecycle Phase

☑ Mission Analysis
☑ Investment Analysis
☑ Solution Implementation
☑ In-Service Management
☑ Disposal

Outputs

a) Commissioned System, System Disposal, Real Property Assets, Current NAS Inventory
b) Lifecycle Cost Estimate
c) Planning Criteria
d) Constraints
e) Tools and Analysis requirements
f) Concerns/Issues
g) Change Requests, Change Release Notices, Configuration Documentation, CSA Updates

Customers

a) EXT
b) EXT, SYN, TS
c) ITP
d) SYN, TS, RSK, RM
e) IA
f) RSK
g) CM

Figure 4.13-1. Lifecycle Engineering Process-Based Management Chart

4.13.3.1 Step 1: Identify Needs

LCE identifies system lifecycle requirements, including real estate management, deployment, and transition; integrated logistics support; sustainment; and disposal. Needs are identified primarily during the Mission Analysis phase of the system lifecycle, and this process focuses on identifying the system capabilities needed to fulfill its mission after deployment. Identifying needs is a key part of technology insertion, update, and sustainment, and therefore it will be performed after the initial needs assessment tasks.

4.13.3.1.1 Identify LCE Support Needs

LCE depends on defined service levels that detail the support needed from other systems and services in the NAS. These needs and those of the program determine the means for delivering projected services. This step identifies the demand for services, as defined in the Service Level Mission Need during the AMS Mission Analysis phase and the program requirements. Often, a system's mission is to extend the capabilities of other services (e.g., system capabilities to meet additional performance requirements. The services being "extended" in this manner are a key element in determining the performance of the system under question. Changes to the original system will affect the services provided to the system under question, and these changes must be accounted for in the determining the LCE support needs.

Tip

For example, the Wide Area Augmentation System is used to augment the integrity of the Department of Defense's NAVSTAR Global Positioning System to meet the needs of civil aviation.

The system's program documentation describes the services that support logistical activities and maintenance support capabilities. An example of such a support service definition is the "supply chain" for supplying material to operations that is used to deploy new components for sustaining and expanding the system and also for maintaining and repairing in-service components.

4.13.3.1.2 Define Logistic Requirements

LCE defines the logistical requirements for supporting the system resources. Typically, the resources support is defined in the context of the system's overall scope and complexity during the entire system lifecycle.

4.13.3.1.3 Identify Deployment Needs

Deployment of a system into the National Airspace System (NAS) will often be through phases driven by a number of factors, including budget constraints, vendor schedules, technology maturity, service environment, physical infrastructure, and logistical issues. LCE addresses phased deployment and identifies the key events initiating the activities associated with each phase. LCE allocates lifecycle costs to each deployment phase, including costs associated with in-service testing, logistics, and maintenance support.

4.13.3.1.4 Define Performance Audit Measurements

LCE identifies and specifies operations and maintenance metrics used to evaluate support performance for systems having multiple deployment phases. Support performance requirements are applied to engineering support functions, maintenance personnel, and supply chain components. Technical performance requirements are established as a result of other SE processes (notably Requirements Management (Section 4.3), Interface Management (Section 4.7), and Validation and Verification (Section 4.12)).

4.13.3.1.5 Develop Earned Value Management Metrics

Identify and specify metrics for use as the Earned Value objectives for WBS items allocated to system deployment and maintenance. EVM is used to monitor costs and measure program performance. EVM offers many benefits when one measures program status against an established baseline, but it is not always the best means to compare project benefit alternatives. In evaluating project benefits, one needs to weigh such factors as the value of the various alternatives to providing NAS services and the costs associated with not providing the system at all. Discrete lifecycle activities should be consistent with WBS entries and defined in terms of their entry and exit criteria; schedule and cost criteria are then developed to support these criteria. Level-of-effort approximations should be avoided except where existing contracts require it.

4.13.3.2 Step 2: Technical Assessment

Technical assessment is evaluated at the In Service Performance Review (ISPR), which is typically held every 2 years after commissioning. The ISPR is a formal technical review to characterize the In-Service technical and operational health of the deployed system by assessing risk, readiness, technical status, and trends in a measurable form that will substantiate In-Service support and budget priorities. (See subsection 4.2.6 in Integrated Technical Planning (Section 4.2) and Appendix C for additional information.)

This assessment addresses not only potential incorporation of existing technology into design solutions, but also looks at the risks and limits imposed by and on that technology. Each alternative considered is analyzed against the changing technologies available in the marketplace. Available technologies are studied for use in the design under consideration, potential improvements to design performance, improvement to maintainability of the resulting system, cost-effectiveness, and maturity. The technical assessment may indicate that the system is operating sufficiently (within operational and performance criteria), or it may indicate the need to insert new technology to return the system to operational performance criteria.

4.13.3.2.1 Evaluate Performance Audit

Analyze performance audit results and provide Concerns and Issues to the Risk Management element.

4.13.3.2.2 Evaluate Maintenance Support Facility

Evaluate the Maintenance Support Facility capabilities in supporting system maintenance. The results of this evaluation will include Lifecycle cost estimates (provided to Requirements Management), and Concerns and Issues (provided to Risk Management) as work products.

4.13.3.3 Step 3: Technology Insertion

The need for a new technology that makes a performance or functional improvement previously not possible an option must be carefully weighed against the risk imposed by that technology. The potential benefits of inserting the technology must outweigh the potential risks to cost, schedule, and performance. When considering the potential technology insertion, one must consider the impacts to the end user through human factors analysis. (See subsection 4.8.3,Human Factors Engineering, in Specialty Engineering (Section 4.8).)

If the technology assessment indicates new technology is warranted, promising candidate technologies will be evaluated as possible solutions. Some technological opportunities may result, based on the decisions related to the logistics elements. If the decision is to use commercial-off-the shelf (COTS) products, LCE should identify those items that will probably become obsolete within 5–7 years. This creates a need to develop a plan to support these items in the out years of the system's lifecycle. LCE recommends preplanned product improvement or alternative improvement options. Inputs may include results of an analysis of the existing system showing opportunities for insertion of technology, the technology assessment, a listing of new products available in the commercial marketplace (COTS), operations and maintenance costs of existing systems, and results of an Investment Analysis.

LCE may conclude that a technological opportunity is beyond the scope of an existing Acquisition Program Baseline. If technology insertion offers a potential for improving safety, significantly lowering costs, or improving effectiveness, a revision of the Service Level Mission Need is required. The updated Needed Capability section should describe the technological opportunity. The description should **not** seek to justify a specific solution or an acquisition program.

Technology Insertion (TI) is also considered the step that defines how systems may replace obsolete components and remain in service. This is a result of system activity that identifies components needing replacement due to lack of support or to acheive technical advantage. TI includes the following steps:

- Identify Technological Opportunities during the Mission Analysis lifecycle phase
- Collect the technical data to support schedule and cost decisions to make the baseline changes
- Define the support equipment to deploy the proposed system changes
- Identify new technology insertion resulting in changes to the maintenance support facility (e.g., second-level engineering support, outsourcing strategies, and other maintenance requirements).

4.13.3.4 Step 4: Analyze Performance

This LCE step periodically measures the system's performance against the approved baseline. The performance criteria are defined in the design. System performance is evaluated periodically.

4.13.3.4.1 Define Performance Audit Objectives

Performance audits measure the technical performance of a system (or service). They measure each service function provided by the system under consideration for consistency with the service level included with the approved baseline. Since the approved baseline is subject to change over a system's lifecycle, a performance audit will verify the service functions for each service level.

4.13.3.4.2 Analyze Investment Performance

There are two stages in investment performance analysis. The first is the AMS Initial Investment Analysis phase, which focuses on the set of viable alternatives. LCE provides a lifecycle cost estimate for each of these alternatives. An important artifact produced at this time is the preliminary program requirements (pPR). The Final Investment Analysis phase refines the physical architecture for the selected alternative and adds maturity to the documentation. The fPR (Office of Management and Budget Exhibit 300, Attachment 1) and the program specification are completed and finalized. LCE provides a refined lifecycle cost based on the fPR. Steps in the investment performance analysis include the following:

- Identify metrics affected by planned investment objectives. These objectives should support the business by identifying cost, schedule, and technical performance as deviations against the baseline plan.

- Determine lifecycle cost based on primary logistical elements, including costs associated with maintaining computer resources support, support equipment (test equipment and tools), and maintenance support facility over all system lifecycle phases.

4.13.3.5 Step 5: Operational Assessment

At deployment, the system perfectly matches the baselined fPR. Over time, either the operational needs can change or the system deviates from the baseline due to the service environment, requiring an operational assessment. The Service Environment Assessment (OEA) is the key measurement of the operational enviroment's capability to support the system as it is currently configured according to the approved baseline. The areas considered in this assessment are also described in the National Airspace Integrated Logistics Support (NAILS) documentation. However, the LCE OEA activity is oriented toward monitoring operational processes and support facilities to achieve the values of the deployed system.

Operational performance is monitored and analyzed, and data is provided as a basis for optimizing current operations and planning for future upgrades. Sustainment engineering provides COTS product obsolescence projections and determines their potential impact on system operational capability and sustainment. LCE, in its data analysis, does the following:

- Monitors and analyzes system performance
- Optimizes current operations
- Identifies technology opportunities and plan for future upgrades
- Identifies obsolescence issues and determine the impact

4.13.3.6 Step 6: Establish Service Environment

LCE provides the initial scope and complexity assessment for the system or its Service Environment and for any proposed changes. It also manages the system's lifecycle, including real estate management, deployment and transition, integrated logistics support, sustainment, and disposal. It identifies constraints for system lifecycle attributes, including:

- NAILS
- Deployment and Transition
- Real Property Management
- Sustainment
- Disposal

4.13.3.6.1 NAILS

NAILS, a critical functional discipline, establishes and maintains a support system for all FAA products and services. The objective is to provide the required level of service to the end user at minimal lifecycle cost to the FAA. This policy applies not only to new acquisition programs, but also to sustainment of fielded products and services. LCE is responsible for all logistics activities during the life of the system and determines all program logistic attributes.

(Note: NAILS and Integrated Logistics Support (ILS) are the same and are used interchangeably. FAA documentation refers to both NAILS and

ILS. Both are included in this explanation in case one or the other terms is used during the course of procurement.)

NAILS provides a structured discipline for defining support constraints and acquiring support assets so that fielded products can be operated, supported, and maintained effectively over their entire service life. The primary goal of NAILS is to provide high product availability at the lowest cost.

NAILS is responsible for identification and acquisition of the support items identified as a result of an analysis of the elements. The nine elements that the FAA uses that need to be addressed are:

- Maintenance planning
- Maintenance support facility
- Direct-work maintenance staffing
- Supply support
- Support equipment
- Training, training support, and personnel skills
- Technical data
- Packaging, handling, storage, and transportation
- Computer resources support

It is fundamental to sound ILS planning that these elements are addressed within the context of each phase of the product's lifecycle (Mission Analysis, Investment Analysis, Solution Implementation, and In-Service Management). It is also necessary to manage the interdependencies among these elements within each phase while adhering to the principles of asset supply chain management (i.e., integration of suppliers, users, and schedules).

NAILS determines the parameters of the equipment (reliability, maintainability, and availability). These values will have a direct impact on sparing, depot maintenance, training, maintenance planning, and other elements. The key to a successful acquisition is good communication between the logistics representative and system engineer.

4.13.3.6.1.1 NAILS Inputs

Several inputs are needed to facilitate effective NAILS planning and execution. FAA and Air Traffic Organization (ATO) policy, market research, technology, contractor analysis, and other concerns and issues must be considered.

Additionally, design constraints and trade study reports provide information needed to choose between various alternatives.

4.13.3.6.1.2 NAILS Process

The typical steps involved in the NAILS process are:

- Develop NAILS constraints
- Define maintenance concept and support strategy for candidate solution
- Develop NAILS performance, cost, and schedule benefits

- Define strategy for satisfying support requirements
- Define work tasks for obtaining support
- Develop NAILS input for the procurement package
- Perform support analysis tasks
- Define maintenance support facility constraints
- Acquire NAILS assets
- Conduct In-Service Readiness Review for NAILS

4.13.3.6.1.3 NAILS Outputs

NAILS outputs include the Integrated Logistics Support Planning section of the SEMP or LCP, including maintenance concepts, support requirements, and any related concerns and issues. This planning section describes how the FAA will support each logistics element. This plan is developed early in the lifecycle, coordinated with system engineering, and is updated as information is further defined. It forms the basis for the contractor's Integrated Support Plan.

4.13.3.6.2 Deployment and Transition

4.13.3.6.2.1 Deployment

Deployment planning prepares for and assesses the readiness of a solution to be implemented into the NAS and is contained in the LCP. Deployment planning is part of a continuous In-Service Review process that begins early in the lifecycle management process, usually during development of requirements in the Concept and Requirements Development portion of the AMS Mission Analysis phase. All programs undergo some degree of deployment planning to ensure that key aspects of fielding a new capability are planned and implemented, as well as to ensure that deployment does not create a critical deficiency in the NAS.

4.13.3.6.2.2 Transition

Transition involves all work activities for installing the new system at the key site, conducting the tests for reaching the In-Service Decision (ISD), and transitioning from the legacy to the new system. It also covers all work activities to install subsequent systems at each operational site and qualify them for operational service. This includes the transition planning section of the LCP, which documents how to transition operations and maintenance from the existing system to the new system. The scope of activities includes preparing the site, installing and testing the equipment, conducting dual operations, familiarizing field personnel with the new equipment, obtaining full operational support, and removing and disposing of replaced assets. Trouble-free deployment and transition requires thorough planning early in the lifecycle and cooperation between the service organization, facility team, system contractor, and regional and site personnel during deployment.

4.13.3.6.2.2.1 Deployment and Transition Inputs

The implementation schedule identifies when each site will receive the new equipment and dispose of the old. The test schedule is used in developing the overall deployment or implementation schedule. FAA/ATO policy will identify the steps for deployment and commissioning.

4.13.3.6.2.2.2 Deployment and Transition Process

Conducting deployment planning involves coordination among and participation by many critical functional disciplines. Tradeoffs among cost, schedule, performance, and benefits relative to these functional disciplines must also include the impact of deployment and implementation considerations. Deployment planning tools (such as a tailored In-Service Review Checklist) assist in identifying, documenting, and resolving deployment and implementation issues. Methods and techniques include, but are not limited to, a tailored application of generic tools; integration of checklist issues with other emerging issues (such as problem test reports from program tests and evaluation); development of action plans to resolve checklists and other items; and documentation of the results of issue resolution and mitigation. Consistent deployment planning shall be documented in the contractor's Statement of Work and associated efforts. The results of deployment planning (and issue resolution) activities are briefed periodically (e.g., at acquisition reviews), presented at the ISD meeting, summarized in an ISD memorandum, and audited during the post-ISD followup and monitoring activities. Typical activities used to deploy and transition from the existing system to the new system are:

- Develop cutover plan for key site
- Prepare key site for new system
- Install and check out system at key site
- Integrate and test system at key site
- Prepare Independent Operational Test Readiness Declaration
- Conduct Independent Operational Test and Evaluation
- Conduct field familiarization testing for key site
- Prepare for the ISD
- Obtain the ISD
- Conduct dual operations at key site
- Commission key site into operational service
- Dispose of replaced assets at key site
- Develop cutover plan for each site
- Prepare each site for new system
- Install and check out system for each site
- Integrate and test system for each site
- Conduct field familiarization testing for each site
- Conduct dual operations for each site
- Commission in operational service for each site
- Dispose of replaced assets for each site

4.13.3.6.2.2.3 Deployment and Transition Outputs

Completion of an In-Service Review Checklist and an ISD allows the system to be deployed to the field, marking the entrance to the Solution Implementation phase of AMS. The final output of deployment and transition is a commissioned system and the disposal of the old system.

4.13.3.6.3 Real Property Management

The Real Property Management process ensures recording of all real property assets that the FAA owns, leases, and utilizes. Functions of real property accountability— which are to be documented in an automated information system—include, but are not limited to, documentation, verification, and confirmation of the existence of real property records.

The Assistant Administrator for Financial Services records and manages all FAA real property assets. More information is in the Interim Fixed Asset System database (http://www.faa.gov/aba/html_fm/ifas.html).

4.13.3.6.3.1 Real Property Management Inputs

The inputs include a list of space constraints, location of existing equipment, and recommendations for new or modified facilities for the product. Facility drawings showing equipment location, spares storage, support equipment and test benches, and other items that use space will be identified.

4.13.3.6.3.2 Real Property Management Process

The system engineer performs the following tasks related to property management:

- Determines whether real estate must be acquired for FAA-related projects by identifying space constraints, locations, and the requirement for new or modified facilities

- Notifies real estate experts of the need for purchase and ensures that the property is recorded in the real estate database upon purchase/lease

4.13.3.6.3.3 Real Property Management Outputs

The results of the real property analysis form the basis to determine what real property is required. Real property management uses this recommendation to obtain any necessary property assets (through purchase, lease, or other arrangement) with assistance of real estate experts.

4.13.3.6.4 Sustainment

Sustainment is the activity that ensures that the operational system remains at its required capability and quality.

4.13.3.6.4.1 Sustainment Inputs

The Sustainment/Technology Evolution process may need any or all of the following inputs:

- Design constraints

- External pressures

- Operations and maintenance costs

- A list of spares that are difficult or impossible to obtain

- A list of new technology developments and components that can be used to enhance the sustainment of systems
- A list of new commercial products and results from market research
- Demonstrations by vendors

4.13.3.6.4.2 Sustainment Process

The Service Level Mission Need (SLMN) serves as the basis for Investment Analysis and is revalidated at the Investment Decision. LCE shall ensure that logistics inputs are included in this document. As a program proceeds through implementation, fielding, sustainment, upgrade, and eventual replacement, the SLMN is revalidated periodically. The Service Organization, working with the field users, will assess the current performance of existing equipment and provide an analysis of how best to sustain as well as plan for future upgrades or replacements (Figure 4.13-3).

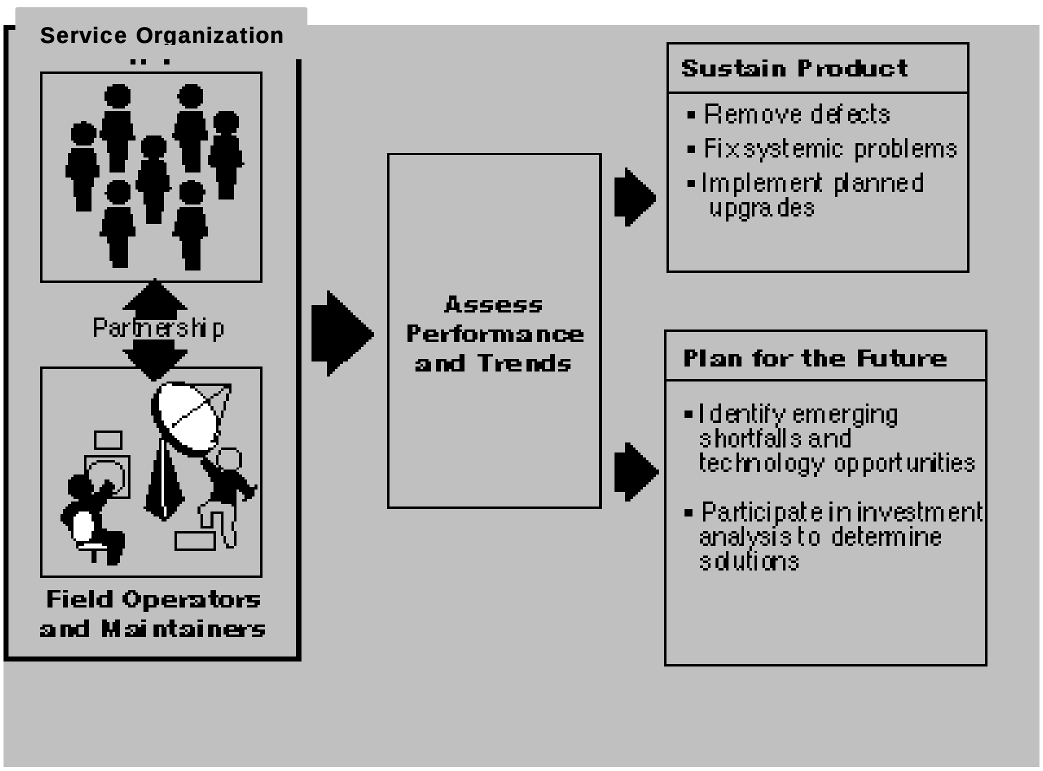

Figure 4.13-3. Assessment of Equipment Performance

The Investment Decision stipulates implementation of any preplanned product improvements. Sustainment resources in the acquisition program baseline are used to upgrade components of fielded products (e.g., printers or processors) as needed. The objective is to develop evolutionary products and rapidly insert new technology rather than to periodically replace fielded products.

LCE assists the Service Organization and its system engineering efforts throughout the lifecycle in collecting and assessing data for use in evaluating product or service effectiveness. These activities shall include:

- Tracking and evaluating reliability, maintainability, and availability performance and supportability issues
- Analyzing supportability issues caused by market-driven products and analyzing system or subsystem obsolescence
- Determining the most cost-effective means of avoiding projected supportability shortfalls
- Assessing integration of obsolescence-driven system changes with new constraints
- Evaluating the impact of engineering changes, performance shortfalls, or technological opportunities on ILS products and support services
- Supporting revalidation or development of Mission Need Statements

4.13.3.6.4.3 Sustainment Outputs

LCE produces a plan to correct systemic problems and remove defects from systems and implement planned upgrades and a list of emerging shortfalls and technology enhancements for future systems. Lessons-learned databases may contain samples of these plans, or the service organization may have examples.

Service Life Extension Programs may be used to keep older systems in the field by incorporating new technology. This may increase the service life of the system and lower maintenance costs.

4.13.3.6.5 Disposal

An important element of any product's lifecycle is the process used to remove facilities from the NAS operational inventory and ultimately dispose of them. Besides funding concerns, a number of logistics issues shall be considered as a system approaches the end of its commissioned life.

Disposal includes all activities associated with disposal management; dismantlement/demolition/removal; restoration; degaussing; or destruction of storage media and salvage of decommissioned equipment, systems, or sites.

4.13.3.6.5.1 Disposal Inputs

Potential inputs include:

- The implementation schedule for the new system and proposed dates for removal of the existing system
- A list of spares, line replaceable units, documentation, and other items related to the system being replaced
- A list of any hazardous materials or items that need special handling

4.13.3.6.5.2 Disposal Process

SE efforts to support disposal of a system being replaced occur during the new system's implementation phase. The Integrated Technical Planning Process (ITP) process (Section 4.2) is used to develop a Disposal Plan under FAA Order 4800.2, Utilization and Disposal of Excess and Surplus Personal Property. LCE supports the ITP process in developing a disposal plan that identifies the systems, components, assemblies, and so forth that will be removed, disposed of, or cannibalized; any environmental issues; place of disposition; the person responsible for disposal; as well as many other factors. Previous disposal plans contain examples of items that should be considered.

LCE shall conduct an assessment of the system to determine the need to scavenge usable parts/subsystems from facilities slated to be decommissioned. This source of usable parts/subsystems is particularly important for items that are no longer being manufactured. This opportunity must be weighed against the costs of component removal, shipping, shop/vendor refurbishment, and warehousing. LCE may require the expertise of an engineering service in determining existence any hazardous materials within the system.

4.13.3.6.5.3 Disposal Outputs

Outputs may include:

- A schedule identifying when each existing system will be removed and shipped to a disposal location
- A list of items that contain hazardous materials or precious metals or that need special handling
- A list identifying items that can be used in other systems

4.13.4 Tools

LCE tools include:

- **Logistics Information System.** This is the inventory control and ordering system for the FAA.
- **Spares Planning Model.** This model assists in the provisioning process by estimating the range and quantity of spares based on failure rates, cost, and other factors.
- **Logistics Management Information guidance.** This guidance is used to identify to the contractor the logistics analysis required on the system and the expected outcome.
- **Bar coding.** This methodology is defined in the statement of work. It is used to track spares and configuration management of the system.
- **FAA Acquisition System Toolset (FAST).** This is FAA's reference for all documents and tools used during the acquisition process.
- **Interim Fixed Asset System database.** This FAA database, managed by Financial Services, records real property assets (http://www.faa.gov/aba/html_fm/ifas.html).

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